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ABSTRACT

Mexico's television-based rural education program, Telesecundaria, has been in operation for over 30 years, and now serves almost 800,000 students in grades 7-9 in 12,700 rural communities. Communities can initiate a Telesecundaria program by providing at least 15 primary school completers with a place to study. The national and state education ministries provide the rest--a teacher, television, signal decoder, satellite dish, wiring, the instructional program, books, and teacher training. Lessons consist of a 15-minute televised program, followed by a guided 35-minute teacher-student dialogue, and a 10-minute break before the next lesson begins. Throughout the curriculum, there is an emphasis on students playing an active role in engaging the community in efforts to improve their quality of life. Courses are designed to involve students in group activities and to be relevant to the students' rural environments. Inservice training of Telesecundaria teachers is also provided through televised programs. Almost 75 percent of Telesecundaria students successfully complete grade 9, 21 percent continue on to high school, and 15 percent pursue technical careers. A complete breakdown of costs is presented. The satellite that distributes the program reaches beyond Mexico--Panama, Costa Rica, and Guatemala are now using it. Future plans include opening 4,500 new Telesecundaria schools, a high school program, a junior high school program for adults, and use of computers and the Internet in schools with access to telephone lines. (TD)

Telesecundaria:
Using TV to Bring Education to Rural Mexico

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Mexico City, Mexico

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Telesecundaria: Using TV to Bring Education to Rural Mexico

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"The TV programs opened my mind."

*Son of poor farmer, now a
high-level government official.*

Introduction

In response to the growing demand for increasingly higher levels of universal education, many countries are searching for cost-effective strategies for increasing access to and improving the quality of secondary schooling in rural areas. For 30 years now, Mexico has addressed rural education demands through a unique and successful TV-based educational program called Telesecundaria. Initially using microwave and now broadcast satellite, this comprehensive program provides a complete package of support to teachers and students in remote rural areas. Particularly notable is the fact that the program has been sustained over a 30-year period, expanding and improving, despite numerous changes in government and administrations. Another distinguishing feature of Telesecundaria is that it is a complete and integrated approach to delivering education at a distance. It is a comprehensive instructional model that enables schools to deliver a complete junior secondary curriculum at costs comparable to those provided in more populated, urban areas. The Telesecundaria model offers policymakers in other countries a cost-effective, viable solution to increasing rural access to a quality secondary education.

Background

During the 1960s, the Mexican government was confronted by a shortage of trained teachers willing to work in remote rural areas, and an inadequate supply of schools to accommodate secondary students, particularly in the 200,000 rural communities with populations of less than 2,500 inhabitants. The Mexican government decided to use television as the solution to these obstacles. In 1968, Mexico's Ministry of Public Education (Secretaria de Educacion Publica - SEP) began broadcasting educational programming to 6,500 students living in rural *pueblos* in seven states centered around Mexico City. Thirty years later, almost 800,000 students in grades 7 - 9 are enrolled in this highly successful national program. During its early years, Telesecundaria grew at an average rate of 20% per year, slowing to 10% in the 1990s (Table 1). Telesecundaria is now available in 12,700 rural communities, and its 30-year anniversary was celebrated on January 21, 1998.

What Does Telesecundaria Look Like?

As one of three government models for providing mid-level education, Telesecundaria constitutes 16% of the overall junior secondary enrollment, with traditional general schools accounting for 50% of the enrollment, and technical schools the remaining 34%.

Table 1: Telesecundaria's Actual and Projected Annual Growth Rate, 1968-2004

SCHOOL YEAR	STUDENT	GRADES	SCHOOLS	TEACHERS
1968	6,569	304	304	304
1988-1989	454,030	24,474	8,070	21,203
1989-1990	465,840	26,171	8,319	22,502
1990-1991	479,613	27,151	8,576	23,576
1991-1992	495,268	28,406	8,849	24,906
1992-1993	522,797	29,481	9,011	25,802
1993-1994	566,440	30,785	9,431	27,205
1994-1995	628,455	33,324	10,690	29,799
1995-1996	686,360	36,669	11,788	33,679
1996-1997	767,696	40,116	12,663	36,432
1997-1998	833,702	43,211	13,785	39,527
1998-1999	900,889	46,594	15,046	42,910
1999-2000	963,295	49,996	16,065	46,312
2000-2001	1,002,901	53,308	17,097	49,624
2001-2002	1,062,870	55,611	17,349	51,927
2002-2003	1,088,152	57,087	17,541	53,403
2003-2004	1,098,628	57,665	17,675	53,981

Source: Ministry of Education. "General Coordination for Educational Modernization. Telesecundaria Unit." *Consolidating Telesecundaria Service 1997-2003*.

Telesecundaria offers the same curriculum found in traditional schools, but differs in that it is delivered by distance in addition to in-person education.

Communities can initiate a Telesecundaria program by providing at least 15 primary school completers and a place to study, sometimes donated private or community land and buildings. The remaining resources are provided by National and State-level Education Ministries and include a teacher, a television, a digital signal decoder, a satellite dish, wiring, the instructional program and textbooks, and teacher training. Although a Telesecundaria school may begin with a single grade, it typically expands to a full complement of grades 7 to 9 as students move through the program. The typical Telesecundaria school has three classrooms and three teachers — one for each grade, and an average of 19 students per grade, with students attending school for 30 hours per week, 200 days per year — the same as in the regular school system.

Teaching and Learning

Instruction is delivered through three mechanisms: television broadcasts, teachers and texts. Each lesson consists of a 15-minute televised program, followed by a carefully guided 35-minute teacher-student dialogue, and a 10-minute break before the next TV lesson begins. Lessons are broadcast twice each day to accommodate morning and afternoon streams; the first broadcast is delivered between 8:00 a.m. and 2:00 p.m., and the second from 2:00 p.m. to 8:00 p.m. There are over one-hundred televised programs for each subject and grade. For example, there are 181 lessons in 7th grade mathematics, 105 in biology, etc.

After watching a televised segment, which introduces the subject concept and theme, students study the relevant material in a specially-designed textbook (described later), followed by teacher-led discussions to help students consolidate and integrate the content and to address any unanswered questions or concerns. This is followed by students engaging in activities designed to apply the lesson to a practical situation or

Telesecundaria in Durango

Telesecundaria teachers and students in the rural community of Pastor Rouaix, in the northern State of Durango, grow and harvest pumpkins, corn and lemons, selling them at low prices to local villagers. Students also raise pigs and make small wood items, such as napkin holders and bookshelves, working cooperatively with community members. Their intention is both to promote community interest in larger-scale agriculture and to generate funds with which to enhance school facilities. For example, they have recently purchased air conditioners to quell the impact of the region's 100°F-plus temperatures on the classroom environment. This particular school also has a dancing club, a band and a choral group.

experiment, and closes with an assessment of student understanding by the teacher, by individual students, and as a group.

Pedagogy

Telesecundaria's curriculum has always had a community orientation and an emphasis on rural development. However, in 1993 the community orientation was significantly strengthened due to the urging of staff in the Telesecundaria Unit who proposed the strategy to the Ministry of Education. At the same time, Telesecundaria adopted the new National curriculum, thereby requiring that all programs produced to that point be redesigned to reflect the new curriculum.

The struggle for Telesecundaria curriculum designers has been to create a pedagogically sound balance among the visual power of televised images, demanding and intellectually invigorating learning activities that require reading and research, and the concretizing and motivating influence of hands-on, project-based activities that relate to students' lives and communities.

Throughout the curriculum, there is an emphasis on students playing an active role in engaging the community in efforts to improve their quality of life. Activities include having students focus on understanding and working to solve problems in areas such as hygiene, pollution, water accessibility, human rights, and productivity. Special days are set aside throughout the year to promote health, arts and culture, or produc-

tivity, particularly in areas of local economic interest, such as farming or animal care and production. In addition, three times a year, students present to their communities, specially-planned group projects intended to benefit the community. Students both promote the projects and are responsible for ensuring that their parents are involved in the projects.

Curriculum Materials

Print. The print materials used in Telesecundaria classrooms differ from those used in traditional classrooms, which have a separate textbook for each subject, with approximately ten subjects per grade. Telesecundaria students have two types of books provided to students at no charge.

A four-volume book of **Basic Concepts** provides detailed explanations of the televised lessons. All core subjects are covered in a single book, with each subject receiving about 30 pages of text. However, each book covers only 50 days of schooling, so four volumes are required to cover the entire 200-day school year. Although students receive each volume at no charge, they are expected to return it in good condition in order to receive subsequent volumes. If they either do not return a volume, or wish to own a set of books, a nominal fee of \$0.35 is charged for each book.¹

A **student learning guide** helps to clarify the televised lessons by involving students in group activities. The activities are designed to engage students in

¹ For practical purposes all currency is stated in U.S. dollars.

analyzing and synthesizing information and in applying the lesson contents to a practical situation, often one associated with activities related to the rural environments in which students live, such as agriculture, forestry or fishing. For example, one lesson involves students in discussing environmental issues and then going into their communities to identify environmental problems, causes and solutions. They are asked to think through how their environment has changed due to human influence, why it has changed, and how to prevent or correct negative changes. Student assessment materials are included in the learning guides, and each learning guide also covers 50 days of instruction, thus requiring four volumes.

A **teacher's guide** contains learning objectives and suggested instructional strategies, generally strategies that emphasize the use of small groups and student activity. Suggestions are also provided for integrating the information provided through the various resources: TV, text, and learning guides. The second section of the teacher's guide explains more fully the main concepts in each lesson and shows the relationships to topics and concepts covered in other subjects and lessons. The guide also describes obstacles the teacher might encounter due to insufficient materials or learning tools, such as science laboratory equipment, and suggests possible accommodations. It also offers strategies for adapting the lesson to individual student's needs and local contexts.

Televised Programs. The televised programs have changed substantially over the 30-year life of Telesecundaria, evolving from a black and white, one-hour "talking heads" format to today's 15-minute shows which are lively, situational, and quite similar to network programs for children, although with an explicit pedagogical orientation. The broadcasts often address several related subjects within a lesson, and are designed to assume a greater reliance on the abilities of the teacher in the classroom. Programs vary substantially across subjects, but most emphasize a connec-

tion with real life situations and active learning. Students are shown working independently and in small groups, engaging in group discussions and in project work. For example, a biology program shows students in natural wooded or desert settings, observing, recording, drawing pictures, cataloging and labeling flora, fauna, and wildlife.

Summer School. Students who need remedial assistance can attend a four-week summer program, reviewing only the topics and skills in which they are performing poorly. Only about 10% of the summer school enrollments are Telesecundaria students, while 35% are secondary students from regular or technical schools. The remaining 55% are primary students who need remedial work to prepare for entering grade 7. Because of the success of the summer program, it is being used by more students each year.

TV Production

Three institutions collaborate to produce the televised programs: the Telesecundaria Unit (Unidad de Telesecundaria, UT), the Educational Television Unit (Unidad de Television Educativa, UTE), and the Latin American Institute for Educational Communications (Instituto Latinoamericano de la Comunicacion Educativa, ILCE). The staff of the Telesecundaria Unit includes teachers, communications experts and specialists in the production of educational materials. This group is responsible for the instructional model, the curriculum contents, teacher training, and the production of student and teacher texts. The Educational Television Unit produces the televised components of Telesecundaria. The Latin American Institute for Educational Communications is responsible for a broad range of distance education programming, and publishes a bimonthly magazine that lists programming for all six channels of educational and cultural television that form Red EDUSAT (EDUcation via SATellite).² ILCE is an international organization, based in Mexico

² Five channels are used for other educational and cultural purposes, with one channel being used to provide training for Telesecundaria teachers.

City, and was created in 1956 by UNESCO and the Mexican Ministry of Public Education to assist Latin American countries with using technology for educational purposes. ILCE works under contract with the Ministry of Education to operate distance education programming, of which Telesecundaria is but one component.³ Telesecundaria staff are part of the Ministry of Public Education and of ILCE.

In the design or redesign of a televised module, teachers and subject and pedagogical experts are consulted. Production time per 15-minute module is approximately 20 working days, with a cost range of \$30,000 to \$50,000. Most of the programs produced in the past decade are like small movies, with a script, a music composer, a director, actors, editors, and, for some productions, computer programmers who create special scenes or cartoons. To date, some 4,500 student instructional programs have been developed across all junior-secondary subjects covered in the national curriculum,⁴ along with 2,000 programs for training teachers. Of the 6,500 program modules, about 3,850 are currently in use. The others remain in stock. A program is maintained in stock until significant changes are made in the subject content or pedagogy, with some lasting as long as five or ten years. Nearly 3,000 modules are currently used for instruction, 500 are teacher training modules, and the remaining are used in the summer program. Each module has been placed on videocassette in response to numerous requests from abroad, but videos typically are not sent to schools, although future plan include video distribution to a limited extent.

Broadcasts. Shows are broadcast to all Telesecundaria sites at one time on one of the six EDUSAT channels. For example, all schools view grade 7 math at 8:03 a.m., grade 8 math at 8:19 a.m., and grade 9 math at 8:35 a.m. Then a second subject begins at 8:51, 9:07, etc. Over an academic year, approximately 3,850 programs are broadcast, including subject courses for students, summer school programs and

teacher training. Because of the large number of schools (12,663), it is less costly to broadcast the programs than to distribute the videotapes.

Evaluation. Teacher and student feedback is sought on the televised modules and all instructional materials are subject to a systematic and ongoing evaluation process managed by the Telesecundaria Unit. This process involves annual regional and national meetings, where teachers gather over a three-day period with State and central authorities to discuss problems they may be having with the broadcasts or other aspects of Telesecundaria. Regular supervision is done by specially-trained staff who visit Telesecundaria schools across the country.

Teachers

In most school systems, each course at the junior-high level is taught by a subject specialist, in contrast to the primary level where one teacher teaches all subjects. However, since most rural areas in Mexico have insufficient numbers of teachers, or even enough students to justify several teachers per grade level, Telesecundaria students receive instruction in all subjects from a single teacher, supplemented by the televised programs and instructional materials. It is this issue that has created the most resistance from teachers' unions, which are concerned that televised broadcasts and the use of only one teacher per grade would threaten teachers' jobs. However, at this point in time, the controversy appears to have subsided.

³ UTE has a training Academy that offers courses in various aspects of television production. The Academy attracts students from producers of educational television throughout Mexico and Latin America, as well as staff of private television stations who find the training costs to be quite reasonable. ILCE also has an Academy that offers a Masters Degree in Communications and Educational Technologies and an extensive array of workshops, courses, seminars and lectures. Experts from Europe, Israel, Japan, Canada, the United States and Latin America are regularly invited to give lectures or seminars, some of which are filmed and broadcast via EDUSAT.

⁴ Optional programs also are developed and available for Telesecundaria schools to select, including: democracy, ecology, and several deemed suitable for rural contexts, such as: agriculture; bee keeping; rabbit, pig, poultry and fish raising; and fruit production.

In Mexico, all teachers are required to have a college degree in order to be certified. Individuals attend professional colleges, such as engineering, medicine or teaching, rather than general colleges. A survey completed by the Telesecundaria Unit in 1997 found that 60% of Telesecundaria teachers are qualified for junior secondary-level teaching, while the remaining 40% are other professionals, such as engineers or doctors who may be unable to find sufficient employment in their stated professions, particularly in the rural areas, or simply may prefer teaching. While teachers in a traditional school would have attended a teaching college and completed a year of guided, school-based practice, those that enter Telesecundaria as other professionals only receive one-week of intensive training prior to entering the classroom, learning day-by-day with the help of the televised programs and other inservice sessions that are offered for all teachers.

Those interested in becoming a Telesecundaria teacher apply at the State education offices and must meet the requirements of that State. All candidates must go through a selection process at the State level, and be willing to live in a rural area; be knowledgeable of active, practical methods of teaching (which they may have learned as an optional course in their professional college); and have a community orientation, since they are required to promote community activities through their students.

The inservice training of Telesecundaria teachers, and supervisors is also provided through televised programs aired in afternoons or on Saturdays. In these sessions, teachers attend workshops led by a trainer, watch a TV broadcast, and study from two books provided for each subject — a teaching content book and an activities guide. These books are in addition to the teacher's guides described above. Moreover, both National and State-level education authorities offer a range of courses and workshops throughout the year which are available to all teachers, and more long-term courses are offered during summer sessions.

Salary levels for teachers are set by the States within guidelines determined by the central Ministry. Salaries for Telesecundaria and regular teachers are comparable and no additional benefits are provided to attract teachers to rural areas. After receiving their college diplomas, all teachers can qualify for salary increases by accumulating points for completed inservice courses. In addition, they can qualify for promotions based on years of service and degrees attained. However, the promotions are granted only when a vacancy becomes available.

Evidence of Performance

Almost 75% of the students who enter Telesecundaria at grade 7 successfully complete grade 9. However, 1994 figures show that only 21% of Telesecundaria students continue on to high school, compared with 85% of grade 9 students in urban areas. The lower enrollment of Telesecundaria students is due largely to the limited number of secondary schools located in rural areas. It is estimated that another 15% of Telesecundaria students pursue technical careers. Table 2 shows that Telesecundaria students are substantially more likely than other groups to pass a final grade 9 examination set and administered by the State and certified by the central Ministry. These exams serve both to certify successful completion and to select for senior high school attendance. However, the regular and Telesecundaria students do not take the same examination, although both exams are based on National standards and both must be certified by the State.

A 1973 study conducted by the Institute for Communications Research at Stanford University and the Mexican Ministry of Public Education found no difference in the quality of education between the Telesecundaria schools and those in the regular or vocational programs. A more recent study conducted by the Inter-American Development Bank (IDB) was sufficiently positive to cause the IDB to contribute toward the expansion of Telesecundaria beginning in 1998. A recent priority of the Government has been to

conduct more formal evaluations of the entire system, and since 1993 when the new curriculum was launched, regular evaluations of the TV programs and textbooks have been conducted, including analysis of content, timing, sequencing, and sound and image quality. Data is being gathered from teachers, parents, supervisors and students, and a more formal, ongoing evaluation is being designed.

Equipment and Facilities Telesecundaria is broadcast through Mexico's educational broadcast system called Red EDUSAT, which is transmitted through Solidaridad I, a government-owned satellite administered by the Ministry of Communications and Transportation, and reaches all of Mexico, the south of the United States, Central America and part of South America.

Each Telesecundaria school has at least three television sets, a decoder to decompress EDUSAT's digital signal, and a 1.9 minimum meter external satellite dish, at a total cost of approximately \$2,000 per school, including installation and wiring. Larger schools are likely to have more TVs, and schools with more than five TVs require a second decoder. About 10% of Telesecundaria schools use solar power.

A majority (85%) of the Telesecundaria schools are located in purpose-built buildings constructed by the government, and have 3 to 9 classrooms, restrooms, a library, a science laboratory, playground, and often a

piece of land for farming. The remaining 15% are often poor, ill-equipped facilities. However, even the more well-endowed Telesecundaria facilities are smaller and less substantial than are the traditional general or the technical middle schools.

Costs

Estimates of the costs for Telesecundaria are provided in Table 3. They are included as an illustration of the type and structure of costs that can be expected when designing a program like Telesecundaria. Precise accounting of costs was not possible due to three main factors: the age of the program, the distributed funding sources of the program, and shared resources among Telesecundaria and other programs. Table 3 includes costs for VCRs, libraries, and laboratories for all 12,700 schools, although these investments are just beginning to be made on a large-scale, but are included because they believed to be valuable additions to the program.

The figures provided estimate the cost of the program as if it became fully operational in a single year and include the costs associated with equipping and maintaining all 12,700 schools. However, the program only has been able to scale to this level over a period of three decades. Others wishing to replicate a program like Telesecundaria are not likely (nor is it necessarily desirable) to reach the number of schools or provide the same breadth of programming in a single year. Before a new program reaches a comparable scale, how-

Table 2: Comparisons of Examination Pass Rates by Type of School

Type of School	Exam Pass Rates (%)
Traditional	74
Telesecundaria	93
Technical	72
Secondary for Workers	68
Total Secondary Population	76

Source: Basic Statistics of the National Educational System. CYCLE 1995-96. Ministry of Public Education.

ever, per pupil costs will be somewhat higher than those shown in Table 3. Smaller programs are likely to see considerably higher annualized investment and recurrent costs per student.

The quantification of necessary resources was made difficult by the distributed nature of the Telesecundaria program in Mexico. The total costs represent contributions from every level of government, often varying considerably by state and locality. In addition, staff that are centralized at the National level often contribute to several programs including Telesecundaria. Where exact figures were not available, reasonable proxies are provided. Nevertheless, with these caveats in mind, significant trends are suggested by the data.

Table 3 lists investment cost and recurrent cost separately. Although an investment might be paid in a lump sum at the outset of a program, only a portion of the value of the investment is used each year. Therefore, in addition to unit and total investment costs, investment data have been converted to annualized costs, and assume an opportunity cost of investment of 10% (see column labeled "Annual or Annualized Cost per Unit"). This average annual cost combines depreciation and the cost of money in a single figure.

Investment costs represent nearly 25% of total costs, while recurrent costs are about three times the annualized investment cost. This demonstrates the importance and necessity of sustained financial commitment to educational technology projects well beyond the initial investment period. These findings are generally consistent with findings elsewhere regarding the structure of costs for educational technology projects in Latin America.⁵

The last two columns of the table illustrate the percentage of total and recurrent costs for each cost item. Television related expenses including production and equipment account for approximately, 19% of

the total costs. Recurrent costs are heavily influenced by staff expenses, with school staff accounting for 53% of total recurrent expenses. These same recurrent, personnel costs are a greater percentage of annual total costs than the total annualized investment costs.

The Mexican Government views Telesecundaria as a social project, committed to ensuring that all children have an equal opportunity high quality schooling. While costs of the program may appear high, the Telesecundaria program brings high quality resources to small villages and rural areas which could not otherwise provide comparable educational services.

The Future

Between 1998 and 2002, the Ministry of Public Education is planning to open 4,500 new Telesecundaria schools to address the needs of an additional 250,000 students. It is expected that these new schools also will have video libraries, which will include externally-developed videos on related educational and cultural topics, as well as Telesecundaria videos.

Although many schools have requested video conferencing that would allow interaction between students and the television presenter, the high costs of this technology render its use unlikely anytime soon. However, less costly telecommunication and information technologies are anticipated in the near future, such as low-level satellites and fiber optics that compress voice, image and data through the same channel at higher speeds and bandwidth, and Internet-based communication to use in conjunction with the televised programs.

Telesecundaria's success, buttressed by parental urging, has spurred the government to initiate two new TV-based educational programs, including a three-year

⁵ See for instance the discussion of financing educational technology in Latin America and the Caribbean: Education and Technology at the Crossroads. A Discussion Paper. World Bank. April 1998.

Table 3. Costs of the Telesecundaria Program (US\$/1

Program Parameters:										
Students	Modules @ 130 Per Subject/2	Student- Class Ratio	Total Classes	Teachers @ 0.91 Per Class	Schools @ 3.17 Classes	Opportun- ity Cost of Finance	Average Sq. M Per Student	School Space Per Sq M	Ave. hours Broadcast per Subject	Cost Per Channel Hour
767,700	3,900	19	40,100	36,400	12,700	10%	4	\$30	65	\$1,000

Cost Item	Unit	Useful		Investment		Annual or		Annual		% Tot.	% Rec.
		Life of Invest- ment	Number of Units	Cost		Annualized Cost Per Unit/3	Annual Cost	Annual Cost Per Student			
				Per Unit	Total						
Investment Cost											
Television Related											
Scripts	Module	8	3,900	10,000	39,000,000	1,874	7,310,317	9.52	1.7		
Program Production	Module	8	3,900	30,000	117,000,000	5,623	21,930,950	28.57	5.2		
Printed Materials, Preparation	Module	8	3,900	10,000	39,000,000	1,874	7,310,317	9.52	1.7		
Satellite Antenna (including decoder)	School	5	12,700	1,000	12,700,000	264	3,350,228	4.36	0.8		
Television Receivers (3 per school)	School	5	38,100	375	14,287,500	99	3,769,007	4.91	0.9		
VCRs	School	5	12,700	200	2,540,000	53	670,046	0.87	0.2		
Subtotal					224,527,500		44,340,864	57.76	10.4		
Start-Up Costs (planning, training)	Subject	8	30	25,000	750,000	4,686	140,583	0.18	0.0		
Other Facilities & Equipment											
Basic classroom space	Student	40	767,700	120	92,124,000	12	9,420,546	12.27	2.2		
Library and Books	School	10	12,700	3,000	38,100,000	488	6,200,600	8.08	1.5		
Video Library and Materials	School	10	12,700	1,800	22,860,000	293	3,720,360	4.85	0.9		
Renovation, Wiring, Laboratory	School	12	12,700	10,000	127,000,000	1,468	18,638,941	24.28	4.4		
School Furniture	Student	15	767,700	100	76,770,000	13	10,093,242	13.15	2.4		
Science Lab. and Equipment	School	8	12,700	1,000	12,700,000	187	2,380,539	3.10	0.6		
Total Investment Cost/4					594,831,500		94,935,674	123.66	22.3		
Recurrent Cost											
Television Related											
Space Segment (Broadcast)/5	Subject		30			65,000	1,950,000	2.54	0.5	0.5	
Continuing Program Devel.	Subject		30			3,000	90,000	0.12	0.0	0.0	
Personnel											
Principals' Salaries & Fringes	School		12,700			4,200	53,340,000	69.48	12.5	16.1	
Teachers' Salaries & Fringes/6	Teacher		23,700			4,000	94,800,000	123.49	22.3	28.7	
Training & Training Supplies	Teacher		36,400			500	18,200,000	23.71	4.3	5.5	
Maintenance & Operation											
Equipment Maintenance	Class		40,100			230	10,025,000	13.06	2.4	3.0	
Building Maintenance	School		12,700			2,000	25,400,000	33.09	6.0	7.7	
Print Materials	Student		767,700			15	11,515,500	15.00	2.7	3.5	
Distribution of Print	Student		767,700			9	6,909,300	9.00	1.6	2.1	
Distribution Blank Cassettes	School		12,700			50	635,000	0.83	0.1	0.2	
Electricity, Phone, Water	School		12,700			1,500	19,050,000	24.81	4.5	5.8	
Insurance, Theft &/or Loss	School		12,700			1,000	12,700,000	16.54	3.0	3.8	
Supplies, Other	School		12,700			1,000	12,700,000	16.54	3.0	3.8	
State and Central Administrative Costs	School		12,700			5,000	63,500,000	82.71	14.9	19.2	
Total Recurrent Cost							330,814,800	430.92	77.7	100.0	
Total Annual Investment and Recurrent Cost							425,750,474	554.58	100.0		

/1 Based on actual costs, estimated costs or estimated opportunity costs, adjusted for inflation to 1997.

/2 Average number of modules per subject assumes 10 subjects a year for total of 30 subjects in the program. The 130 average also includes training and summer modules.

/3 Investment costs are annualized to estimate combined depreciation and financial costs.

/4 Total figures reported assume that Telesecundaria went to full scale inside of one year. Investments were actually accumulated over a 30 year period.

Please see "cost" section in text for further explanation.

/5 Cost per channel hour of transponder time estimated from current public and commercial satellite costs or charges.

/6 Not including principal, who is also a teacher.

high school program for grades 10 to 12, and a 9-month junior high school program for adults, both of which will begin in 1998 and will operate out of Telesecundaria facilities in afternoons in rural areas and evenings at work sites. It is expected that a complete high school program will be distributed on a national scale by 2002. In the case of the junior high for adults, several employers, particularly larger corporations, have requested the program for delivery in the workplace and have offered to pay for all hardware, furnishings and classroom installation.

Another innovative program created by ILCE, called REDESCOLAR, began as a pilot project in 1996, and uses computers and the Internet in 144 primary and junior high schools and in 32 teacher centers across the country. Plans are to install similar computer technology in all schools that have access to telephone lines, thereby allowing Internet communication across sites.⁶

Bandwidth is a key technical issue to be tackled in the years ahead. Greater bandwidth will allow greater opportunity to receive and send images. Other possibilities include fiber optics or other ground carriers which are being considered as alternatives or supplements to satellite.

Beyond Mexico

Because Mexico's education satellite, *Solidaridad 1*, covers Mexico, Central America and the Caribbean, northern Latin America, and the southern United States, Telesecundaria has attracted the interest of its neighbors.

In 1996, by an initiative of ILCE, the Ministers of Education of the seven Central American countries signed a Cooperative Agreement with the President of Mexico to use the Telesecundaria system and the program's printed materials, broadcasting through EDUSAT. Mexico provided training in the preparation of TV scripts as well as media education for organizers

and teachers. Panama began broadcasting Telesecundaria programs in 1996, Costa Rica in 1997 and Guatemala in 1998. Honduras and El Salvador are taping and classifying the programs in order to broadcast them on their own. In 1998, the Telesecundaria summer program will be offered to youngsters in Hispanic communities of the USA in a collaborative effort with the Mexican Ministry of Foreign Affairs. The broadcasts will be complimentary and only a small fee will be charged for the printed materials.

Summary

All nations confront issues of limited educational resources in rural areas, but Mexico has successfully addressed these constraints through Telesecundaria. It is a project that has been paid for internally, sustained without external donor support, and thrived despite numerous governments, administrations, political assaults by teachers' unions, and other challenges. Over its 30-year existence, Telesecundaria has become more pedagogically sophisticated, integrating the curriculum with community activism and constructivist pedagogy. Students are active learners in ways that lead them to believe that school and life are integrally connected, and that they can play a role in improving both their own personal lives, as well as the lives of others in their communities — an accomplishment worth noting for even the most traditional schools.

To find out about adapting Telesecundaria in other countries or regions, contacts can be made through ILCE in Mexico City or the Mexican consulates and the 32 Mexican Cultural Institutes in the US.

⁶ At the present time, Mexico has an average of approximately one computer for every 1,000 students, across all levels of schooling, including university.